



Case Report

Male with Long-Standing Heart Failure and Left Bundle Branch Block with Acute Chest Pain: Is It Needed for Urgent Revascularization?

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ARTICLE INFO

Keywords:

Long-standing heart failure;
Left bundle branch block;
Acute chest pain;
Revascularization.

ABSTRACT

Background : Patients with acute heart failure and left bundle branch block (LBBB) presenting acute chest pain have many clinical challenges to perform the diagnostic and therapeutic process. Recent recommendations revealed that the patients with LBBB (new or presumably new) should be performed early revascularization. However, several clinical controversies occurred due to scientific gaps between current evidence and recommendations. Therefore, the review of other approaches to assess this setting might be required.

Objective : This case report aims to describe factors related to early revascularization strategy in patients with long standing heart failure and left bundle branch block.

Case : A 46-year-old man with the previous history of dyspnea (long-standing heart failure) was admitted to our hospital with recurrent chest pain and acute heart failure. Electrocardiogram (ECG) showed LBBB suggesting acute myocardial infarction (excessive discordance in the precordial lead). He had normal serial cardiac enzymes with ongoing ischemia symptoms. He had been decided not to perform urgent reperfusion therapy. After five days of hospitalization, he discharged home with medicines. Our case report provided an example of applying the existing algorithm to assess acute chest pain in congestive heart failure, regardless of ST-segment deviation in LBBB.

Conclusion : Clinical judgement and the use of objective findings offer the best way to determine the need for early reperfusion in our case.

1. Introduction

Heart failure is the most common health problem in the emergency department (ED) admissions, either acute or chronic congestive heart failure (CHF). However, acute coronary syndrome (ACS) should be evaluated while facing congestive heart failure patients. Patients with CHF or symptoms of CHF presenting chest pain have been correlated with independent predictors of hospital mortality and cardiac death.¹ This circumstance led us to assess whether patients with CHF and chest pain have a more unsatisfactory outcome than those with no chest pain.

Heart failure with left bundle branch block (LBBB) is known as advanced heart failure. Therefore, patients with acute chest pain and LBBB have unique and challenging diagnostics and therapies. The electrocardiographic (ECG) diagnosis of ACS is often unknown due to altered myocardial depolarization.² The primary consideration in these patients is a higher risk for acute myocardial infarction (AMI), congestive heart failure, and sudden death compared to patients without

LBBB.³ Patients with LBBB were reported to have a higher prevalence rate of severely decreased left ventricular ejection fraction (<30%) and might have the worse clinical outcome.⁴ When CHF coincides with ACS, CHF may have an increased risk of mortality.⁵

LBBB in patients with suspected myocardial infarction (MI) is commonly not the result of focal infarction but might result from chronic structural heart disease. Studies showed that less than half of patients with acute chest pain (suspected AMI) and LBBB had an occluded culprit artery, and I might have an essential impact on the revascularization.⁶ Recognizing the chronicity of LBBB without evaluating previous ECG is impossible due to asymptomatic condition. In most cases, true AMI-associated LBBB is closely related to a very high mortality rate.² This situation has led to the evolving considerations of whether reperfusion therapy has more incredible benefits than medical management.

Our present case demonstrated the alternative strategies in patients with severe heart failure with LBBB and acute chest pain.

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Our present case emphasized the importance of appropriate strategies selection for these patients. Understanding the clinical hemodynamic condition, ECG presentation, and imaging or laboratory studies could provide additional insight into this clinical setting.

2. Case Illustration

A 46-year-old man visited the emergency department (ED) due to dyspnea and recurrent chest pain in the mid-chest for two days before admission. He worked in a cigarette factory as a paper cutter for about 20 years. The chest pain was not radiating, pressure-like sensation, and chest pain duration was about 30 minutes. He had a past medical history of shortness of breath for one year. On arrival in the ED, he suffered significant diaphoretic, shortness of breath, nausea, and chest pain with a Visual Analog Scale (VAS) of 9/10. Blood pressure was 138/99 mmHg, respiratory rate was about 30/minute, and the heart rate was 110/minute. His neck veins were increased (JVP R+4 cmH2O), and blood pressure in both arms was equal. He had rales heard over the lung bases.

The patient was closely monitored, and serial ECGs were performed. The ECG (figure 1) revealed the sinus rhythm with complete LBBB, showing excessive discordance with ST-elevation/S-wave amplitude of -0.40. Based on modified Sgarbossa criteria by Smith,² it was highly suggestive left anterior descending coronary artery occlusion. The serial ECGs (figure 2) showed no significant changes ST-T segment with the same ST elevation/S-wave amplitude as the previous ECG.

Laboratory findings revealed haemoglobin 12.6 g/dL, white cell count 9390/uL, thrombocyte 276000/uL, urea 61.3 mg/dL, creatinine 1.88 mg/dL, serial troponin I 0.7 ug/L and 0.9 ug/L.

Chest X-ray (CXR) showed marked cardiomegaly with a cardiothoracic ratio (CTR) was about 75%. Official echocardiography was performed after hospitalization, showing severe systolic left ventricle dysfunction (EF 33%), akinetic wall segments at basal-mid anteroseptal, and inferoseptal with other segments were hypokinetic, and dilated left ventricle (LV) and left atrium (LA). It also showed LV spontaneous echo contrast.

A patient with acute heart failure with LBBB complicating ACS clinical presentation may have three possible diagnostics such as equivalent ST-elevation myocardial infarction (STEMI), non-ST elevation ACS (NSTEMI-ACS), and non-ACS. We concluded that our case was classified as NSTEMI-ACS. Close monitoring of clinical or hemodynamic condition may have been a key for the diagnostic approach for urgent revascularization consideration.

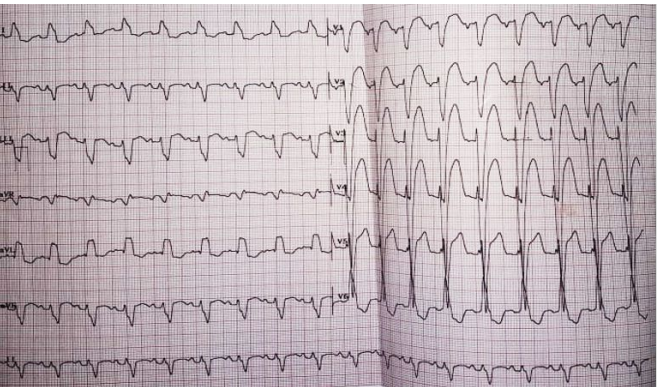


Figure 1. ECG showing sinus tachycardia with wide QRS at a width of 160 ms and LBBB. ST/S ratio of lead V3-V4 was -0.4, suggesting equivalent STEMI in the first presentation

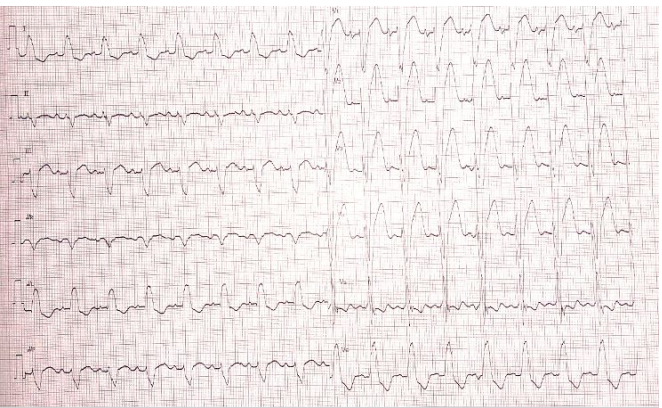


Figure 2. Twelve hours later, after the first ECG, it shows sinus rhythm with heart rate 90/minute. No features to suggest the evolution of acute ST-elevation myocardial infarction are obvious

3. Treatment

As initial treatment, his breathing was supported with a nasal cannula with 5 L of O₂. The patient had given a loading dose of acetylsalicylic acid (320 mg), clopidogrel (300 mg), isosorbide dinitrate (5 mg) sublingual, intravenous furosemide (40 mg), and subcutaneous enoxaparin (60 mg). Due to the unresolved chest pain, he was given continuous drip isosorbide dinitrate up to 5 mg per hour. This patient ultimately was decided to prefer conservative treatment to urgent revascularization.

4. Outcome and Follow Up

He was admitted to the cardiac intensive care unit for one day and then transferred to the ward. The patient had been given a subcutaneous anticoagulant for five days. Uptitration dose of captopril switching to ramipril and bisoprolol could relieve the heart failure condition. The patient was discharged home and follow-up in the cardiology clinic.

Table 1. Calculation of the HEART score.¹⁰

HEART score	
History	2 = highly suspicious
	1 = moderately suspicious
	0 = slightly of non-suspicious
ECG	2 = significant ST-depression
	1 = nonspecific repolarization disturbance
	0 = normal
Age	2 = ≥ 65 years
	1 = ≥ 45 < 65 years
	0 = < 45 years
Risk factors	2 = ≥ 3 or history of atherosclerotic disease
	1 = 1 or 2
	0 = no risk factors known
Troponin	2 = ≥ 3x upper limit
	1 = 1x – 3x upper limit
	0 = ≤ upper limit
Low Risk	HEART score ≤ 3

Note; HEART, history, ECG, age, risk factors, troponin; ECG, electrocardiogram.

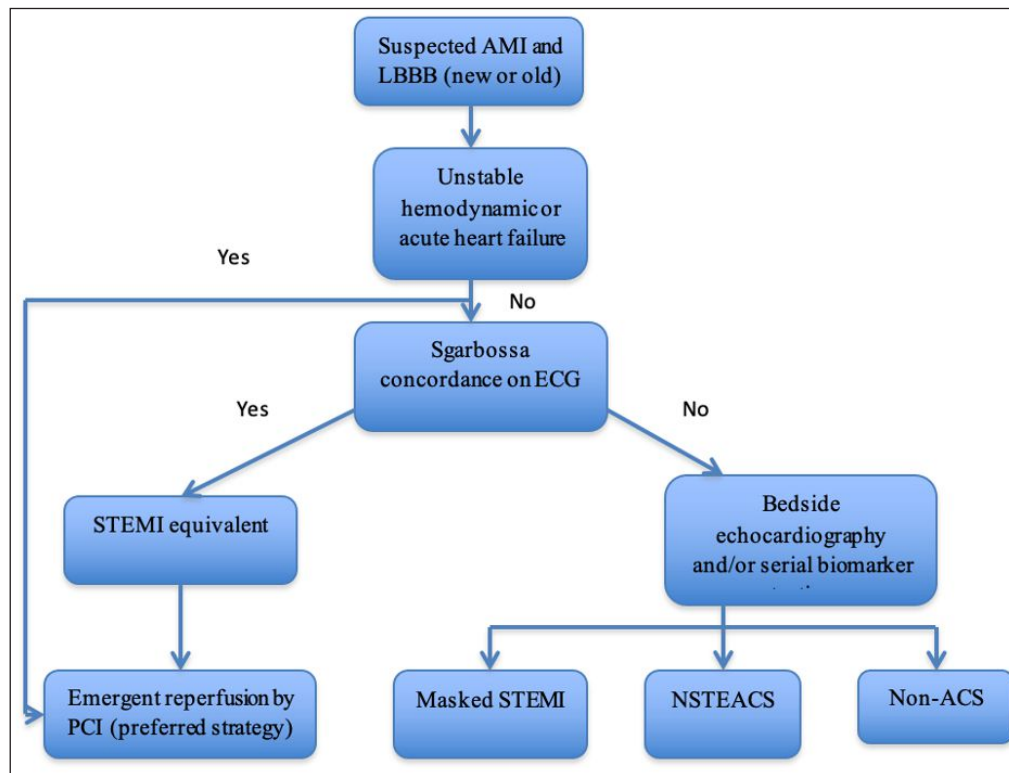


Figure 3. Diagnostic algorithm for patients with LBBB and suspected AMI.⁶

5. Discussion

This patient's clinical setting was very challenging. The patient had no documented ECG, whether LBBB was acute or chronic setting. Recognizing acute chest pain in LBBB is very challenging for more than 60 years. The ECG changes in patients with LBBB remains controversial, although many criteria suggest for diagnosis of AMI in LBBB.²

Global Registry of Acute Coronary Events (GRACE) study and international registry of ACS patients found a similar incidence of acute heart failure concurrent with ACS (15.6% versus 15.7%), regardless of ST-segment deviation and biomarker level.⁷ Based on the 2017 European Society Cardiology (ESC) guidelines, patients with acute chest pain (ongoing ischemia) and LBBB seem to be like equivalent STEMI.⁸ In this setting, we should consider reducing reperfusion times. Otherwise, Larson et al. revealed that false-positive cardiac catheterization laboratory activation is frequent among patients with LBBB.⁹ This patient had been decided to optimize medical management. This strategy may be questionable due to clinical controversies.

On the other hand, an ACS is a clinical diagnosis that needs to be identified rapidly and accurately. Acute chest pain is the most ACS presentation, although only an average of 25% (range 12.2-59.1%) are ultimately diagnosed with ACS. Most acute chest pain patients (83%) have non-cardiac causes. Hence, an accelerated diagnostic tool needs to be performed to diagnose ACS. Clinical risk stratification tools should be performed to assess all objective findings in the risk stratification of chest pain patients.¹⁰

The diagnostic pathway based on the HEART (History, ECG, Age, Risk Factors, Troponin) score is recommended to use.¹⁰ The HEART score (table 1) represents a major adverse cardiac event (MACE) within six weeks after initial acute chest pain. A HEART score of 3 or less showed 35-46% low-risk patients. However, a HEART score of 7 or greater represents very high-risk patients, with over 50% of

Table 2. High-risk criteria for chest pain suggestive of ACS.¹⁰

Symptoms	Prolonged ongoing chest pain (≥ 20 minutes)
History	Prior PCI in the last 6 months Prior CABG
Clinical findings	Pulmonary oedema most likely due to ischaemia Hypotension Tachycardia New mitral regurgitation murmur Acute heart failure Killip class > I New systolic murmur
ECG	Dynamic ST changes >0.5 mm during chest pain New or presumably new left or RBBB Sustained ventricular tachycardia High degree atrioventricular block
Biomarkers	Elevated cardiac troponins
Score	GRACE risk score ≥140 HEART score ≥ 7

Note; ACS= acute coronary syndrome; PCI= percutaneous coronary intervention; CABG= coronary artery bypass graft ; ECG=electrocardiogram; GRACE= the global registry of acute coronary events; HEART= history, ECG, age, risk factors, troponin; ECG, electrocardiogram; RBBB=Right Bundle Branch Block

MACE within six weeks.¹¹ In addition, clinical features in table 2 allow the identification of highly suggestive of an ACS.¹⁰

Based on ECG, the Sgarbossa criteria are the most available tool to diagnose MI in LBBB. Sgarbossa et al. revealed that the ST-segment concordance criteria (score ≥ 3) were the most specific for AMI diagnosis in LBBB. On the other hand, ST-segment discordance (score ≥ 3) were the most specific for AMI diagnosis in LBBB. On the other

hand, ST-segment discordance (score ≥ 2) had low specificity of AMI diagnosis.² Smith et al. have modified for discordance ECG criteria to improve diagnostic accuracy, developing modified Sgarbossa criteria. The original criteria of ST-segment discordance are modified with a ratio: ST elevation/S-wave amplitude of ≤ -0.25 .^{2,6} He reported that it was 99% specific and 84% sensitive for left anterior descending artery occlusion.¹²

Based on the above-mentioned clinical tools, our patient could be identified as high risk suggestive of ACS due to acute heart failure, GRACE score of 140, and HEART score of 6. However, our patient with long-standing heart failure and low EF might have difficulty to differ chest pain characteristics in ACS or non-ACS. Lettman et al. proposed that there were no differences in chest pain characteristics between CHF patients with and without ACS. Chest pain was not related to increase mortality in CHF patients.¹

Consequently, a new diagnostic approach proposed by Neeland et al. (figure 3) to help the selection of appropriate strategies for urgent revascularization is pivotal in this setting.^{2,6} The clinical need is greater in non-PCI capable hospital. Serial ECGs, cardiac biomarker, and bedside echocardiography could increase diagnostic accuracy. A rapid rise in serial troponin could represent a masked STEMI. In contrast, a gradual rise and lower peak indicate NSTEMI, whereas static troponin rise represents non-ACS.² In our case, although serial troponin I was normal, the ongoing chest pain and acute heart failure might signal unstable angina pectoris (in which case, reperfusion therapy might be recommended typically).

Bedside echocardiography may be used as an additional examination to gain more information in a clinically complex situation. Point-of-care echocardiographic devices to review cardiac structure and function. The LBBB may be caused by secondary to the chronic cardiac condition in the presence of a dilated cardiac chamber, wall thinning, or valvular abnormalities. On the other hand, a hypokinetic or akinetic segmental wall motion abnormality in the anterior wall may represent a STEMI equivalent.¹³ In our case, bedside echocardiographic examination was not performed yet, and the results showing signs of the chronic cardiac condition were met (dilated LA and LV with markedly hypokinetic wall segments and reduced ejection fraction).

Clinically or hemodynamically unstable patient should be considered for immediate revascularization in this setting. Otherwise, serial ECG should be performed to assess the presence of ST-segment concordance criteria for stable patients. Rapid serial of both biomarker and bedside echocardiography should be considered if concordance criteria are absent. It would ensure the decision of urgent reperfusion.^{2,6} Therefore, our case of acute heart failure presenting ongoing ischemia should be considered for immediate reperfusion, although serial cardiac biomarker was normal.

6. Conclusion

This case report provides an example of reviewing existing algorithm to assess acute chest pain of highly suggestive clinical ACS in congestive heart failure, regardless of ST-segment deviation in LBBB. Clinical judgment and the use of objective findings offer the best way to determine the need for early reperfusion. This approach requires a prospective study to elucidate the outcome after revascularization.

7. Declarations

7.1. Ethics Approval and Consent to participate

Patient has provided informed consent prior to involve in the study.

7.2. Consent for publication

Not applicable.

7.3. Availability of data and materials

Data used in our study were presented in the main text.

7.4. Competing interests

Not applicable.

7.5. Funding source

Not applicable.

7.6. Authors contributions

Idea/concept: FR. Control/supervision: SA. AR. Data collection/processing: FR. Literature review: FR. Writing the article: FR. Critical review: SA. AR. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

7.7. Acknowledgements

We thank to Brawijaya Cardiovascular Research Center.

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